Provider Level Analyses of Receipt of Colorectal Cancer Screening (mostly colonoscopy)

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Life Time Risk of Developing Colo-rectal Cancer
U.S. SEER Registry Data

Probability vs. Age

- Male (blue line)
- Female (magenta line)
Colo-rectal Cancer - Specific Survival Rate, Stratified by AJCC Stage

![Graph showing survival rates stratified by AJCC stage.](image-url)
Effect of age

Colo-rectal cancer: Overall Survival Rate stratified by AJCC Stage
Benefits and risks of screening colonoscopy

Benefits:
- The introduction of screening colonoscopy has been associated with reduction in incidence of and mortality from colon cancer.

Risks:
- Created a cohort of “worried-well,” people with “pre-cancer.”
- 1 in 1000 screening colonoscopies result in hospitalization. 1 in 10,000 result in death.
- Major threat is too frequent use, resulting in increased toxicity with no additional benefit.
Screening and surveillance colonoscopy: recommendations on frequency

• Normal Risk Individual:
  − Start at age 50
  − Every 10 years until age 75

• Surveillance for those with abnormalities:
  − Hyperplastic polyps: 10 years
  − 1-2 small (<1cm) tubular adenoma: 5 years
  − 3-10 smaller or one large (>1cm) adenoma: 3 years

• Post surgery for colorectal cancer:
  − 1 year post surgery, then three years after that, then five years after that
Cumulative risk of cancer Dx during follow-up of unresected polyp ≥ 10mm in size

(Stryker et al. Gastroenterology 1987; 93:1009-13)
Background

- Most expert panels recommend repeat colonoscopy in 10 years in patients with normal colonoscopy.
- Surveys indicate that many physicians recommend shorter screening intervals.
- No population based data on over-utilization of colonoscopy.
Schema for selection of study cohorts

236145 Patients aged ≥66 years, colonoscopy in 2001-2003

114468 “Negative” colonoscopy results

24071 “Negative screening” colonoscopy results

Search for additional colonoscopy in 2001-2008

Early repeated colonoscopy after negative screening colonoscopy result

121677 “Positive” colonoscopy, results
82192 Snare
32408 Fulguration
48307 Biopsy

90397 Patients had diagnosis on claims or in prior 3 months consistent with indication other than screening
34732 High-risk diagnoses
47269 Anemia/GI bleeding
49012 Other relevant symptoms
9413 Prior DCBE/CT

Remove colonoscopies with diagnoses on claims or in prior 3 months suggesting an indication other than screening

Early repeated colonoscopy with no clear indication
Relevant diagnoses or procedures in the 3 months prior to repeated colonoscopy and indications for the repeated colonoscopy listed in the Medicare claims

| Relevant Diagnoses and Procedures in the 3 mo Prior to Repeated Colonoscopy | Indication on Claim for Repeated Colonoscopy, No. (%) |
|---|---|---|---|---|---|
| | Anemia/GI Bleeding (n=1252) | Other Relevant Diagnoses (n=906)b | High Risk Diagnoses (n=155)c | Unrelated Diagnoses (n=1955)d | Diagnoses Consistent With Screening (n=4340)e | All (n=8608) |
| Received DCBE/CT in 3 mo before the repeated colonoscopy | 128 (10.2) | 185 (20.4) | 29 (18.7) | 223 (11.4) | 282 (6.5) | 847 (9.8) |
| Diverticulitis in 3 mo before the repeated examination | 21 (1.7) | 46 (5.1) | 5 (3.2) | 90 (4.6) | 82 (1.9) | 244 (2.8) |
| Anemia/GI bleeding in 3 mo before the repeated examination | 766 (61.2) | 208 (23.0) | 50 (32.3) | 516 (26.4) | 765 (17.6) | 2305 (26.8) |
| Other relevant symptoms in 3 mo before the repeated examination | 369 (29.5) | 626 (69.1) | 53 (34.2) | 644 (32.9) | 1059 (24.4) | 2751 (32.0) |
| Prob. indicated | 887 (70.8) | 710 (78.4) | 155 (100) | 0 | 0 | 1752 (20.3) |
| Possibly indicated | 365 (29.2) | 196 (21.6) | 0 | 1024 (52.4) | 1615 (37.2) | 3200 (37.2) |
| Without indications | 0 | 0 | 0 | 931 (47.6) | 2725 (62.8) | 3656 (42.5) |

Abbreviations: DCBE/CT, double-contrast barium enema/computed tomography; GI, gastrointestinal tract.

bThe distribution of relevant diagnoses and procedures in the 3 months before the repeated colonoscopy and the distribution of indications for the repeated colonoscopy listed on the Medicare claim (n = 8608).

cOther relevant diagnoses include abdominal pain, diarrhea, constipation, ischemic bowel disease, irritable bowel syndrome, change in bowel habits, hemorrhoids, and weight loss. See the eAppendix (http://www.archinternmed.com) for specific codes.

dHigh-risk diagnoses include inflammatory bowel disease (17.6%), history of colon cancer (64.0%), and others (18.4%).

eUnrelated diagnoses included diverticulosis (81.2%), diagnoses or symptoms related to the upper GI (5.8%), unspecified functional GI disorder (5.2%), and other (7.8%). Diverticulitis is not an indication for colonoscopy, except as a follow-up examination after acute diverticulitis, or with bleeding. Of the patients in this group, 90 had a prior diagnosis of diverticulitis.

The major diagnoses under codes consistent with screening are benign neoplasm of colon/rectum (54.2%), history of colonic polyps (24.5%), screening for colon cancer (10.7%), and family history of GI cancer (7.4%).


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Cumulative percentage of repeated colonoscopies for patients 66 years or older who underwent a colonoscopy between 2001 and 2003

Percentage of Medicare fee-for-service who underwent early repeated colonoscopy with no clear indication, by health referral region

Provider characteristics associated with early repeat colonoscopy without clear indication.

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Odds of early repeat (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GI</td>
<td>1.00</td>
</tr>
<tr>
<td>Surgeon</td>
<td>1.09 (1.00, 1.18)</td>
</tr>
<tr>
<td>Other/Unknown</td>
<td>1.15 (0.98, 1.30)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Place of Service</th>
<th>Odds of early repeat (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>1.00</td>
</tr>
<tr>
<td>Office</td>
<td>1.16 (1.01, 1.34)</td>
</tr>
<tr>
<td>Ambulatory Center</td>
<td>0.95 (0.88, 1.04)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume</th>
<th>Odds of early repeat (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;440</td>
<td>1.00</td>
</tr>
<tr>
<td>441-740</td>
<td>1.12 (1.01, 1.24)</td>
</tr>
<tr>
<td>741-1180</td>
<td>1.14 (1.03, 1.27)</td>
</tr>
<tr>
<td>&gt;1180</td>
<td>1.44 (1.31, 1.59)</td>
</tr>
</tbody>
</table>

(Multivariable analysis controlling for patient and geographic characteristics)
Provider level analyses of receipt of CRC Screening

1. Role of PCP in ethnic disparities in CRC screening (underutilization) (Singal et al HSR 2012)

2. Role of colonoscopy provider in over utilization of colonoscopy (Sheffield et al, submitted)
Approach

• 100% Texas Medicare files 2000-2009

• Identify patients “up to date” in CRC screening in 2009
  – Fecal occult blood test in 2009
  – Sigmoidoscopy or double contrast barium enema in 2005-2009
  – Colonoscopy in 2000-2009

• Assess black/white and Hispanic/non-Hispanic white differences in being up to date, and effect of having a PCP and PCP characteristics
The association of having a primary care physician on black versus white and Hispanic versus white odds of being up to date in colorectal cancer screening

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Entire cohort aged 66-75</th>
<th>Cohort aged 74-75</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No PCP (n = 303,013)</td>
<td>Any PCP (n = 357,289)</td>
</tr>
<tr>
<td>Black versus White</td>
<td>0.65 (0.63, 0.67)</td>
<td>0.89 (0.86, 0.91)</td>
</tr>
<tr>
<td>Hispanic versus White</td>
<td>0.58 (0.56, 0.59)</td>
<td>0.79 (0.68, 0.71)</td>
</tr>
</tbody>
</table>

†All models were adjusted with beneficiary age, gender, comorbidity, % black, % Hispanic, and median income of the zip code
Effect of primary care physician characteristics (n = 11,448) on the racial disparity in colorectal cancer testing by multilevel analysis

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Estimate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficiary race (black vs. white)</td>
<td>0.95 (0.92, 0.98)</td>
</tr>
<tr>
<td>Beneficiary race (Hispanic vs. white)</td>
<td>0.80 (0.78, 0.82)</td>
</tr>
<tr>
<td>PCP gender (Female vs. Male)</td>
<td>1.12 (1.08, 1.16)</td>
</tr>
<tr>
<td>PCP U.S. trained (Yes vs. No)</td>
<td>1.10 (1.06, 1.14)</td>
</tr>
<tr>
<td>%White patients in PCP panel (per 10% increase)</td>
<td>1.05 (1.04, 1.06)</td>
</tr>
</tbody>
</table>

*All models were adjusted with beneficiary age, gender, comorbidity, % black, % Hispanic, and median income of the zip code.
Adjusted rates of being up to date with colorectal cancer screening by ethnicity, for the entire cohort, for those with a primary care physician, and for those with a primary care physician adjusted for clustering within primary care physicians.

<table>
<thead>
<tr>
<th>Beneficiary number</th>
<th>Whole cohort 660,308</th>
<th>Those with a PCP† (Stratified Model) 357,289</th>
<th>Those with a PCP† (Multilevel Model) 264,066†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Adjusted Rate (%, 95%, CI)</strong></td>
<td><strong>Diff. from Whites</strong></td>
<td><strong>Adjusted Rate (%, 95%, CI)</strong></td>
</tr>
<tr>
<td>White</td>
<td>50.4 (50.2, 50.5)</td>
<td></td>
<td>59.9 (59.7, 60.1)</td>
</tr>
<tr>
<td>Black</td>
<td>43.4 (42.9, 43.9)</td>
<td>7.0</td>
<td>57.0 (56.3, 57.7)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>39.5 (39.1, 39.9)</td>
<td>10.9</td>
<td>51.0 (50.5, 51.5)</td>
</tr>
</tbody>
</table>
Next: Role of the colonoscopy provider in overuse of screening colonoscopy
Methods

• Identify Texas Medicare recipients aged 70+ who received colonoscopy in 10/1/08 to 9/31/09.

• Identify those colonoscopies judged to be potentially inappropriate.
  – Early repeat screening
  – Age 75+ screening

• Examine the percent of potentially inappropriate colonoscopies as a percent of all colonoscopies for each provider
Results

• Overall percent of potentially inappropriate colonoscopies
  - 12.0% in those 70-75
  - 50.2% in those 70-85
  - 46.8% in those >85

• In multilevel analyses, Hispanic patients (OR=1.73) and women (OR=1.22) were more likely to undergo potentially inappropriate colonoscopy

• There was substantial variation in percentage of patients who underwent inappropriate colonoscopy by colonoscopy provider and by geographic area (in Texas) 24
Comparison of physician characteristics in high and low rate groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Physicians with low rate of inappropriate colonoscopy (n = 131)</th>
<th>Physicians with high rate of inappropriate colonoscopy (n=130)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>121 (92.4)</td>
<td>121 (93.1)</td>
<td>0.82</td>
</tr>
<tr>
<td>Specialty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>118 (90.1)</td>
<td>95 (73.1)</td>
<td>0.003</td>
</tr>
<tr>
<td>Surgery</td>
<td>4 (3.1)</td>
<td>26 (20.0)</td>
<td></td>
</tr>
<tr>
<td>Generalist</td>
<td>9 (6.9)</td>
<td>6 (4.6)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0 (0.0)</td>
<td>3 (2.3)</td>
<td></td>
</tr>
<tr>
<td>Year of medical school graduation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1980</td>
<td>41 (31.4)</td>
<td>30 (23.1)</td>
<td>0.42</td>
</tr>
<tr>
<td>1980-&lt;1990</td>
<td>37 (28.2)</td>
<td>35 (26.9)</td>
<td></td>
</tr>
<tr>
<td>1990-&lt;2000</td>
<td>40 (30.5)</td>
<td>44 (33.8)</td>
<td></td>
</tr>
<tr>
<td>2000+</td>
<td>13 (9.9)</td>
<td>21 (16.2)</td>
<td></td>
</tr>
<tr>
<td>Location of medical school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>91 (69.5)</td>
<td>77 (59.2)</td>
<td>0.08</td>
</tr>
<tr>
<td>Outside of United States</td>
<td>53 (40.8)</td>
<td>40 (30.5)</td>
<td></td>
</tr>
<tr>
<td>Colonoscopy volume (mean, s.d.)</td>
<td>120.1± 62.9</td>
<td>106.8 ± 68.8</td>
<td>0.02</td>
</tr>
</tbody>
</table>
Percent of potentially inappropriate colonoscopies by health service area (HSA)